

**D) AMENDMENTS TO THE DRAWINGS**

None

### **E) REMARKS**

This Response is filed in response to the Office Action dated April 5, 2005.

Upon entry of this Response, claims 1, 2, 4, 5, 10-13, 15, 19-26, 28-32 and 40 will be pending in the Application.

In the outstanding Office Action, the Examiner withdrew claims 16-18 and 27 pursuant to 37 C.F.R. 1.142(b); objected to the specification; rejected claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b) as being anticipated by Wennerberg (U.S. Patent No. 3,157,229); rejected claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b) as being anticipated by Armbruster (U.S. Patent No. 5,954,126); rejected claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b) as being anticipated by Ruppel et al. (U.S. Patent No. 6,039,112); rejected claims 5, 22-23, 25-26, 29 and 31 under 35 U.S.C. § 103(a) as being unpatentable over Wennerberg (U.S. Patent No. 3,157,229) in view of Gregory (U.S. Patent No. 4,434,842).

#### **Election/Restriction**

Applicants acknowledge that the Examiner has correctly recited MPEP §803 as stating that “an application may properly be required to be restricted to one of two or more claimed inventions only if they are able to support separate patents and if they are either independent or distinct.” Applicants only wish to point out that 35 U.S.C. 121 (that provides the authority for the MPEP) specifically states “independent and distinct.” Applicants are unaware of the authority granted by Congress to the USPTO authorizing the USPTO to rewrite the clear language of federal statutes here by substituting the disjunctive “or” for “and,” but Applicants will endeavor to keep track of the latest trends in the law. Applicants therefore cancel the withdrawn claims without prejudice.

**Rejection under 35 U.S.C. 102**

**A. Claims 1, 2, 4, 15, 19-21, 28 and 40 by Wennerberg**

The Examiner rejected claims 1, 2, 4, 15, 19-21 28 and 40 under 35 U.S.C. 102(b) as being anticipated by Wennerberg (U.S. Patent No. 3,157,229), hereinafter referred to as "Wennerberg."

Specifically, the Examiner stated that

Wennerberg discloses unitary mesh 9 (similar to applicant's Figure 8) with a non-circular cross sectional profile and geometric attributes in Figure 1 and 3.

Applicants respectfully traverse the rejection of claims 1, 2 4, 15, 19-21 28 and 40 under 35 U.S.C. 102(b).

As understood, Wennerberg is directed to a plate heat exchanger including corrugated heat exchange plates separated by packing cords, whereby each pair of adjacent plates and the intervening packing cord define a flow path along these plates for passage of a fluid medium. Additionally, a turbulence-promoting member is interposed between adjacent corrugated plates and supported by alternate ridges of the corrugated plates so that the turbulence-promoting member is maintained substantially bisecting the spacing between the adjacent plates. The turbulence-promoting member contains holes formed therein. The fluid medium must flow through the holes of the turbulence-promoting member while traveling between the adjacent plates, which produces a turbulent flow of the fluid medium.

In contrast, independent claim 1 as amended is recited as follows and has been amended to include language requiring the profile of the insert to substantially conform to the at least one of the adjacent plate profiles. This means that the contour of the insert corresponds to the contour of at least one of the adjacent plates. The insert of Wennerberg does not do this as the plate contour alternately converges and diverges from the contour of the insert.

A plate heat exchanger comprising: a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of each pair of adjacent plates provides a flow path boundary for two fluids of

the at least two fluids, the at least one plate having a high thermal conductivity and providing a portion of the flow path boundary for two fluids of the at least two fluids, thereby providing thermal communication between the two fluids on the opposed surfaces of the plate; an inlet and outlet for each fluid of the at least two fluids, the inlet and outlet for each fluid being in fluid communication with each flow path for said fluid; at least one insert member having a plurality of surface microfeatures, the at least one insert member disposed in fluid communication with at least a portion of at least one flow path for at least one fluid, facing surfaces of the at least one insert member and one of the pair of adjacent plates of the plurality of plates being substantially immediately adjacent, the at least one insert member having a profile substantially conforming to at least one of the pair of adjacent plates, the plurality of surface microfeatures for providing enhanced heat transfer between the at least two fluids, the at least one plate forming a portion of the flow path boundary.

In contrast, independent claim 40 as amended is recited as follows and has been amended to include language requiring the profile of the insert to substantially conform to the at least one of the adjacent plate profiles. This means that the contour of the insert corresponds to the contour of at least one of the adjacent plates. The insert of Wennerberg does not do this as the plate contour alternately converges and diverges from the contour of the insert.

A method for providing an enhanced heat transfer surface for use with a plate heat exchanger including a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of the pair of adjacent plates provides a flow path boundary for two fluids of the at least two fluids, the at least one plate providing a flow path boundary having a high thermal conductivity, thereby providing thermal communication between the two fluids on the opposed surfaces of the plate, an inlet and outlet for each fluid of the at least two fluids, the inlet and outlet for each fluid being in fluid communication with each flow path for said fluid, the step comprising: placing at least one insert member having a plurality of surface microfeatures between at least one pair of facing surfaces of adjacent plates of the plurality of plates defining a fluid flow path, the at least one

insert member having a profile substantially conforming to at least one of the at least one pair of adjacent plates, facing surfaces of the at least one insert member and one of the pair of adjacent plates of the plurality of plates being substantially immediately adjacent.

The Examiner is reminded that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.’ *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).” See Manual of Patent Examining Procedure 8<sup>th</sup> Edition (MPEP) § 2131.

In addition, “[t]he identical invention must be shown in as complete detail as is contained in the ... claim.’ *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).” See MPEP, Section 2131.

Several of the features recited by Applicant in independent claims 1 and 40 are not taught or suggested by Wennerberg. First, Wennerberg does not teach or suggest “plates having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids” as recited in independent claims 1 and 40. The plates of Wennerberg lack perimeter flanges, as the “plates [are] separated by packing cords, whereby each pair of adjacent plates and the intervening packing cord define a flow path along these plates for passage of a fluid medium. See col. 1, lines 12-15. Further, Wennerberg lacks an insert member having a plurality of microfeatures as recited in independent claims 1 and 40. The holes in the turbulence promoting member are large enough to permit the fluid medium to flow therethrough between adjacent plates to further agitate the fluid medium, nothing more. Clearly, holes must be up to several orders of magnitude larger than what are deemed microfeatures of the present invention, since it appears that all of the fluid medium must flow through the holes of the turbulence-promoting member while traveling between the adjacent plates. The microfeatures are discussed in paragraphs [0037] through [0039] of the present invention as follows:

[0037] The present invention provides a plurality of surface microfeatures modifying flow in the passages between plate surfaces for providing enhanced heat transfer between the fluids passing in thermal communication with each other in plate heat exchangers. The analysis involving the behavior of the fluids

flowing in plate heat exchangers is extremely complex and not yet fully understood, especially when the fluids undergo phase changes, which is even further complicated by the effects associated with the surface microfeatures of the present invention. However, refrigerant side heat transfer coefficients of at least approximately 700 BTU/°F/ft<sup>2</sup>/hr (at typical design conditions), which is roughly twice the amount of conventional plate heat exchangers, such as depicted in Figs. 1-7, have already been achieved by virtue of these novel surface microfeatures. At least a portion of this significant increase in the heat transfer coefficient may be attributed to improved nucleate boiling or condensated droplet formation, during which superheated bubbles are formed along the surface of the enhanced heat transfer surface of the evaporating fluid as previously described. The presence of the surface microfeatures of the present invention appears to, at the least, provide significantly enhanced nucleate boiling by providing a plurality of sites that are favorable for the formation of the superheated bubbles, and simultaneously promote improved wetting of the surface in evaporating operation. Yet in condensing operation, this surface enhancement can also provide additional heat transfer surface area, faster removal of refrigerant from plate surfaces by capillary forces and by providing nucleation sites at which droplets can form from supercooled vapors, thereby increasing the heat transfer coefficient. For evaporation, these advantageous formation locations not only permit initial nucleate formation, but also appears to retain the nucleate for a period of time, permitting the nucleate to increase in size some amount prior to becoming entrained in the fluid flow stream. For the purposes of simplifying the discussion, the remainder of this description is set forth in terms of formation of nucleates as gas bubbles during an evaporation process. However, it will be understood by those skilled in the art that the present invention provides the same improvements for the phase change in which refrigerant is condensed into liquid from its gaseous state as these sites assist in the nucleation of droplets.

[0038] Once the superheated bubble becomes entrained in the fluid flow stream, the space previously occupied by the bubble is replaced by liquid fluid, which restarts the nucleate boiling process at that location. Without wishing to be bound by theory, it is also believed that once bubble formation and entrainment initially occurs, the location of the initial bubble formation remains a favorable location for subsequent bubble formation by virtue of a portion of the bubble being left behind as a "seed." Another aspect of the present invention appears to optimize the volume of bubbles produced during the nucleate boiling stage, since permitting the size of the superheated bubbles to grow too large decreases the heat transfer coefficient. Further, it is also believed that when sufficiently large bubbles are permitted to form, upon entrainment of the bubble in fluid flow stream, an insufficient amount of the bubble remains to act as a "seed" for subsequent bubble formation.

[0039] An additional believed advantageous aspect of the enhanced bubble formation previously discussed is the tendency to increase the amount of wetted surface of the heat exchanger plates 28, 30 by virtue of capillary action to further increase the heat transfer coefficient. Further, due to this enhanced capillary action, the angle "A" (Fig. 5), which has been limited to the range of about 22-30° F in prior art constructions, may be increased to about 60 degrees or higher, which may provide further heat coefficient gains due to differences in flow behavior of the fluids provided by the increased angle A. Thus, for at least the reasons of enhanced heat transfer, including nucleate boiling and increased surface wettability, the novel surface microfeatures of the present invention provide a significant improvement in the art for plate heat exchangers.

In summary, the microfeatures promote nucleate boiling and provide increased wetting of the heat exchanger plates, which are capabilities the holes in Wennerberg cannot provide. Finally, Applicants must respond to the Examiner's assertion that the turbulence promoting member is similar to the mesh in the present invention as shown in Figure 8, presumably by comparison to Figures 1 and 3 in Wennerberg. First of all, the turbulence promoting member in Wennerberg is substantially flat, the holes being interspersed between corrugated ridges of adjacent plates for fluid medium to pass therethrough. In the present invention, as discussed in further detail in paragraph [0040] apertures 52 in mesh insert 46 are clearance apertures as they permit adjacent plates 28, 30, which are corrugated plates having oppositely directed patterns to directly touch at nodes 42 (see Figure 10). That is, the purpose of the apertures 52 are not for fluid flow, but to permit the ridges of the plates 28, 30 to contact each other, such as for bonding purposes. The Examiner's example is, in fact, an excellent one to illustrate the stark differences between the insert constructions of the present invention and Wennerberg.

Therefore, for the reasons given above, independent claims 1 and 40 are believed to be distinguishable from Wennerberg and therefore are not anticipated nor rendered obvious by Wennerberg.

Dependent claims 2, 4, 15, 19-21 and 28 are believed to be allowable as depending from what is believed to be allowable independent claim 1, for the reasons given above. In addition, claims 2, 4, 15, 19-21 and 28 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 2, 4, 15, 19-21 and 28 are not anticipated nor rendered obvious by Wennerberg and is therefore allowable.

**B. Claims 1, 2, 4, 15, 19-21, 28 and 40 by Armbruster**

The Examiner rejected claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b) as being anticipated by Armbruster (U.S. Patent No. 5,954,126), hereinafter referred to as "Armbruster."

Specifically, the Examiner stated that

Armbruster discloses unitary meshes in Figures 8 and 12 with non-circular cross sectional profiles and geometric attributes in Figure 13.

Applicants respectfully traverse the rejection of claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b).

As understood, Armbruster is directed to a disk cooler, such as for vehicle engines, the cooler consisting of a plurality of tub-shaped disks stacked on top of one another with their edges overlapping, the disks forming hollow chambers, with the adjacent hollow chambers each being traversed by oil or a coolant and provided with inflow and outflow openings provided on opposite sides of a circular sealing collar provided at the center of each disk, the collar forming a through central opening with the sealing collars of the other disks, with a flow guide wall located toward the center being associated with the inflow and outflow openings in each chamber to produce a through flow in the hollow chamber that is as complete as possible. To achieve the more complete flow, turbulence inserts (Figs. 8 and 12) are inserted between the respective disks and configured, by virtue of recesses cut in the inserts, which correspond to elevations formed in the adjacent plates to force the oil and coolant to flow around the inserts in such a way as to travel over most of the surface area of the hollow chamber, improving the efficiency of the disk cooler. These recesses are formed in the inserts by alternately having the insert surface converge and diverge from the contour of the adjacent plates.

In contrast, independent claim 1 as amended is recited as follows and has been amended to include language requiring the profile of the insert to substantially conform to the at least one of the adjacent plate profiles. This means that the contour of the insert corresponds to the contour of at least one of the adjacent plates. The insert of Armbruster does not do this as the plate contour alternately converges and diverges from the contour of the insert.



A plate heat exchanger comprising: a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of each pair of adjacent plates provides a flow path boundary for two fluids of the at least two fluids, the at least one plate having a high thermal conductivity and providing a portion of the flow path boundary for two fluids of the at least two fluids, thereby providing thermal communication between the two fluids on the opposed surfaces of the plate; an inlet and outlet for each fluid of the at least two fluids, the inlet and outlet for each fluid being in fluid communication with each flow path for said fluid; at least one insert member having a plurality of surface microfeatures, the at least one insert member disposed in fluid communication with at least a portion of at least one flow path for at least one fluid, facing surfaces of the at least one insert member and one of the pair of adjacent plates of the plurality of plates being substantially immediately adjacent, the at least one insert member having a profile substantially conforming to at least one of the pair of adjacent plates, the plurality of surface microfeatures for providing enhanced heat transfer between the at least two fluids, the at least one plate forming a portion of the flow path boundary.

In contrast, independent claim 40 as amended is recited as follows and has been amended to include language requiring the profile of the insert to substantially conform to the at least one of the adjacent plate profiles. This means that the contour of the insert corresponds to the contour of at least one of the adjacent plates. The insert of Armbruster does not do this as the plate contour alternately converges and diverges from the contour of the insert.

A method for providing an enhanced heat transfer surface for use with a plate heat exchanger including a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of the pair of adjacent plates provides a flow path boundary for two fluids of the at least two fluids, the at least one plate providing a flow path boundary having a high thermal conductivity, thereby

providing thermal communication between the two fluids on the opposed surfaces of the plate, an inlet and outlet for each fluid of the at least two fluids, the inlet and outlet for each fluid being in fluid communication with each flow path for said fluid, the step comprising: placing at least one insert member having a plurality of surface microfeatures between at least one pair of facing surfaces of adjacent plates of the plurality of plates defining a fluid flow path, the at least one insert member having a profile substantially conforming to at least one of the at least one pair of adjacent plates, facing surfaces of the at least one insert member and one of the pair of adjacent plates of the plurality of plates being substantially immediately adjacent.

The Examiner is reminded that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.’ *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).” See Manual of Patent Examining Procedure 8<sup>th</sup> Edition (MPEP) § 2131.

In addition, “[t]he identical invention must be shown in as complete detail as is contained in the ... claim.’ *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).” See MPEP, Section 2131.

Several of the features recited by Applicants in independent claims 1 and 40 are not taught or suggested by Armbruster. First, Armbruster does not teach or suggest an insert member having a plurality of surface microfeatures as recited by Applicants in independent claims 1 and 40 and as previously discussed. The recesses 33, 35 cut in turbulence insert 32 as shown in Fig. 8, totaling only three apertures, represent a considerable percentage of the total surface area of the cooler disk. Similarly, the recesses 44, 45 and 47 cut in turbulence sheet 43, totaling only five apertures, represent a considerable percentage of the total surface area of the cooler disk. Thus, the recesses cannot possibly be properly construed as microfeatures. Further, the function of the turbulence sheets/inserts are to force the fluid medium to flow along more of the effective surface area of the disks. This forced flow functionality is achieved by the corrugated profile of the turbulence sheets/inserts and how they fit with respect to the adjacent tub shaped disks, such as shown in Figure 13, as referenced by the Examiner. The corrugated profile of turbulence sheets/inserts also do not disclose or suggest being of micro construction.

Moreover, the recesses cut in the turbulence sheets/inserts merely correspond to the elevations formed in the tub shaped disks, and function much differently than the microfeatures of the present invention. If this rejection is maintained, the Examiner is requested to show in Armbruster indications of microfeatures in the turbulence sheets/inserts. Thus, since Armbruster does not teach or suggest all of the limitations recited in independent claims 1 and 40, Applicants respectfully submit that Armbruster does not anticipate Applicants' invention as recited in independent claims 1 and 40.

Therefore, for the reasons given above, independent claims 1 and 40 are believed to be distinguishable from Armbruster and therefore are not anticipated nor rendered obvious by Armbruster.

Dependent claims 2, 4, 15, 19-21 and 28 are believed to be allowable as depending from what is believed to be allowable independent claim 1, for the reasons given above. In addition, claims 2, 4, 15, 19-21 and 28 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 2, 4, 15, 19-21 and 28 are not anticipated nor rendered obvious by Armbruster and is therefore allowable.

**C. Claims 1, 2 4, 15, 19-21, 28 and 40 by Ruppel**

The Examiner rejected claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b) as being anticipated by Ruppel et al. (U.S. Patent No. 6,039,112), hereinafter referred to as "Ruppel."

Specifically, the Examiner stated that

Ruppel et al discloses unitary mesh 7 with a non-circular cross sectional profile and geometric attributes in Figure 5.

Applicants respectfully traverse the rejection of claims 1, 2, 4, 15, 19-21, 28 and 40 under 35 U.S.C. 102(b).

As understood, Ruppel is directed to a plate-type heat exchanger provided with metal turbulence inserts between adjacent plates of the heat exchanger. The turbulent inserts are divided into sections in which a different alignment of rolled metal turbulence sheets takes place in each case. The sections are divided with respect to one another by separating cuts and, because of the different arrangement of their corrugations, have different flow resistances in

sections for the flowing-through medium. The different turbulence insert sections result in a uniform flow in the hollow chambers between the adjacent plates.

In contrast, independent claim 1 as amended is recited as follows and has been amended to include language requiring the profile of the insert to substantially conform to the at least one of the adjacent plate profiles. This means that the contour of the insert corresponds to the contour of at least one of the adjacent plates. The insert of Ruppel does not do this as the plate contour alternately converges and diverges from the contour of the insert.

A plate heat exchanger comprising: a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of each pair of adjacent plates provides a flow path boundary for two fluids of the at least two fluids, the at least one plate having a high thermal conductivity and providing a portion of the flow path boundary for two fluids of the at least two fluids, thereby providing thermal communication between the two fluids on the opposed surfaces of the plate; an inlet and outlet for each fluid of the at least two fluids, the inlet and outlet for each fluid being in fluid communication with each flow path for said fluid; at least one insert member having a plurality of surface microfeatures, the at least one insert member disposed in fluid communication with at least a portion of at least one flow path for at least one fluid, facing surfaces of the at least one insert member and one of the pair of adjacent plates of the plurality of plates being substantially immediately adjacent, the at least one insert member having a profile substantially conforming to at least one of the pair of adjacent plates, the plurality of surface microfeatures for providing enhanced heat transfer between the at least two fluids, the at least one plate forming a portion of the flow path boundary.

In contrast, independent claim 40 as amended is recited as follows and has been amended to include language requiring the profile of the insert to substantially conform to the at least one of the adjacent plate profiles. This means that the contour of the insert corresponds to the contour of at least one of the adjacent plates. The insert of Ruppel does not do this as the plate contour alternately converges and diverges from the contour of the insert.

A method for providing an enhanced heat transfer surface for use with a plate heat exchanger including a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of the pair of adjacent plates provides a flow path boundary for two fluids of the at least two fluids, the at least one plate providing a flow path boundary having a high thermal conductivity, thereby providing thermal communication between the two fluids on the opposed surfaces of the plate, an inlet and outlet for each fluid of the at least two fluids, the inlet and outlet for each fluid being in fluid communication with each flow path for said fluid, the step comprising: placing at least one insert member having a plurality of surface microfeatures between at least one pair of facing surfaces of adjacent plates of the plurality of plates defining a fluid flow path, the at least one insert member having a profile substantially conforming to at least one of the at least one pair of adjacent plates, facing surfaces of the at least one insert member and one of the pair of adjacent plates of the plurality of plates being substantially immediately adjacent.

The Examiner is reminded that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.’ *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).” See Manual of Patent Examining Procedure 8<sup>th</sup> Edition (MPEP) § 2131.

In addition, “[t]he identical invention must be shown in as complete detail as is contained in the ... claim.’ *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).” See MPEP, Section 2131.

Several of the features recited by Applicants in independent claims 1 and 40 are not taught or suggested by Ruppel. First, Ruppel does not teach or suggest an insert member having a plurality of surface microfeatures as recited by Applicants in independent claims 1 and 40 and as previously discussed. Ruppel only discloses the turbulence insert having three sections having differently oriented trapezoidal constructions, the sections providing a different flow resistance, resulting in a more uniform flow through the heat exchanger. See col. 3, line 11 to col. 4, line 13, and Figures 3-6. The novel aspect of the Ruppel insert is the divided sections having differing

alignments and not the sections themselves, i.e., the trapezoidal construction. Other than inflow and outflow connections, Applicants can find no disclosure or suggestion to indicate other apertures formed in the insert plate. Further, Ruppel fails to disclose enhanced performance due to microfeatures, as discussed previously. If this rejection is maintained, the Examiner is requested to show in Ruppel indications of microfeatures in the turbulence insert. Thus, since Ruppel does not teach or suggest all of the limitations recited in independent claims 1 and 40, Applicants respectfully submit that Ruppel does not anticipate Applicants' invention as recited in independent claims 1 and 40.

Therefore, for the reasons given above, independent claims 1 and 40 are believed to be distinguishable from Ruppel and therefore are not anticipated nor rendered obvious by Ruppel.

Dependent claims 2, 4, 15, 19-21 and 28 are believed to be allowable as depending from what is believed to be allowable independent claim 1, for the reasons given above. In addition, claims 2, 4, 15, 19-21 and 28 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 2, 4, 15, 19-21 and 28 are not anticipated nor rendered obvious by Ruppel and is therefore allowable.

**Rejection under 35 U.S.C. 103**

The Examiner rejected claims 5, 22-23, 25-26, 29 and 31 under 35 U.S.C. § 103(a) as being unpatentable over Wennerberg in view of Gregory (U.S. Patent No. 4,434,842) hereafter referred to as "Gregory."

Specifically, the Examiner stated that

Wennerberg discloses all the claimed limitations except a specific opening size.

Gregory discloses a heat exchanger comprising a plurality of alternately stacked plates 1 and inserts 2, wherein the insert 2 is a mesh 3 having a plurality of openings 5 with a diameter of 100 to 3000 microns (i.e. about 0.04 to 0.12 inches) for the purpose of achieving a desired heat exchange.

Since Wennerberg and Gregory are both from the same field of endeavor and/or analogous art, the purpose disclosed by Gregory would have been recognized in the pertinent art of Wennerberg.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Wennerberg openings with a diameter of 100 to 3000 microns (i.e. about 0.04 to 0.12 inches) for the purpose of achieving a desired heat exchange as recognized by Gregory.

Applicants respectfully traverse the rejection of claims 5, 22-23, 25-26, 29 and 31 under 35 U.S.C. 103(a).

Wennerberg is directed to a plate heat exchanger as discussed in greater detail above.

Gregory, as understood, is directed to a plate fin heat exchanger in which the fins include a pair of corrugated sheets having apertures formed therein. The fin sheets are in close proximity to each other so that nucleate boiling occurs between the fin sheets, the bubbles being released by the apertures formed in the sheets.

First of all, Gregory is directed to an immersed heat exchanger construction. That is, heat exchanger plate 1, which is flat, is brazed at locations 8 to alternate ridges of fin 2. See Figure 1 and the specification. A first fluid is in contact with one side of the heat exchanger plate 1, a second fluid surrounding the fin 2, heat transfer from the heat exchanger plate 1 to the fin 2 occurring via conduction at the brazed locations 8. Additionally, there is no disclosure in Gregory as to the flow of the second fluid, but as with immersion heat exchangers, the second fluid remains in “non flow” contact with fin 2. Any movement of the second fluid is brought about by the temperature gradient of the fluid, which alters the density of the second fluid. This cannot be considered to be “flow” in the context of the present invention wherein each of the two fluids flowing through the heat exchanger of the present invention involve directed flow through the heat exchanger. However, solely for the sake of argument that the fluid surrounding the fin 2 is considered to flow in the same way as the present invention, which it does not, the flow path of the fluids in Gregory is not achieved similar to that recited in the present invention. Claim 1 as amended recites:

A plate heat exchanger comprising: a plurality of plates, each plate having opposed surfaces and perimeter flanges, for providing at least one flow path for each of at least two fluids, wherein facing surfaces and perimeter flanges of a pair of adjacent plates of the plurality of plates define a flow path for each fluid of the at least two fluids, and wherein opposed surfaces of at least one plate of each pair of adjacent plates provides a flow path boundary for two fluids of the at least two fluids, the at least one plate having a high thermal conductivity and providing a portion of the flow path boundary for two fluids of the at least two fluids, thereby providing thermal communication between the two fluids on the opposed surfaces of the plate

In other words, in the heat exchanger of the present invention, having, in a simple construction of three overlaid plates, identified as plates 1, 2 and 3, a first fluid flows between plates 1 and 2, and a second fluid flows between the opposite surface of plate 2 and plate 3. In

Gregory, there is only a plate 2, as there is neither a plate 1 or a plate 3, only the confines of the container walls of the heat exchanger. As noted above, the claim as amended requires the contour of the insert to follow the contour of at least one of the plates. Wennerberg as discussed above had this infirmity and Gregory does not solve the problem by correcting the infirmity of Wennerberg.

Stated another way, Applicants submit that Gregory is non-analogous art with respect to Applicants' invention as recited in independent claim 1. As discussed above, Gregory is directed to an immersion heat exchanger. In contrast, Applicant's invention as recited in independent claim 1 is directed to a non-immersion heat exchanger. Applicants submit that one skilled in the art of non-immersion heat exchangers having fluids in directed flow would not look to a reference directed to an immersion heat exchanger having no directed fluid flow to solve problems in the non-immersion heat exchanger field. In addition, the Examiner has cited no passage in Gregory or Wennerberg that would indicate that the fin of Gregory could be used with a non-immersion heat exchanger. Thus, Applicant submits that the Examiner has improperly combined Gregory and Wennerberg and as such, Gregory and Wennerberg, based on the teachings in Applicants' specification, is impermissible hindsight reasoning by the Examiner.

The Examiner is reminded that "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." See MPEP, Section 2143.01.

The Examiner is also reminded that "[i]f the proposed modification or combination of the prior art would change the principle or operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." See MPEP, Section 2143.01.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). See MPEP, Section 2143.03.



Further, the Examiner is reminded that

In making the assessment of differences, section 103 specifically requires consideration of the claimed invention “as a whole.” Inventions typically are new combinations of existing principles or features. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 698 [218 USPQ 865] (Fed. Cir. 1983) (noting that “virtually all [inventions] are combinations of old elements.”). The “as a whole” instruction in title 35 prevents evaluation of the invention part by part. Without this important requirement, an obviousness assessment might break an invention into its component parts (A + B + C), then find a prior art reference containing A, another containing B, and another containing C, and on that basis alone declare the invention obvious. This form of hindsight reasoning, using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result – often the very definition of invention.

Section 103 precludes this hindsight discounting of the value of new combinations by requiring assessment of the invention as a whole. This court has provided further assurance of an “as a whole” assessment of the invention under §103 by requiring a showing that an artisan of ordinary skill in the art at the time of invention, confronted by the same problems as the inventor and with no knowledge of the claimed invention, would select the various elements from the prior art and combine them in the claimed manner. In other words, the examiner or court must show some suggestion or motivation, before the invention itself, to make the new combination. See *In re Rouffet*, 149 F.3d 1350, 1355-56 [47 USPQ2d 1453] (Fed. Cir. 1998).

*Ruiz v. A.B. Chance Co.*, 69 USPQ2d 1686, 1690 (Fed. Cir. 2004)

Combining the fin of Gregory with the turbulence promoting member of Wennerberg renders Wennerberg inoperable. The holes of the turbulence promoting member are of insufficient size to permit the flow of fluid therethrough and are simply incompatible for use in Wennerberg.

Therefore, in view of the above, dependent claims 5, 22-23, 25-26, 29 and 31 are believed to be distinguishable from Wennerberg and/or Gregory and therefore are not anticipated nor rendered obvious by Wennerberg and/or Gregory. In addition, claims 5, 22-23, 25-26, 29 and 31 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 5, 22-23, 25-26, 29 and 31 are not anticipated nor rendered obvious by Wennerberg and/or Gregory and are therefore allowable.

**Objection to the Specification**

The Examiner objected to paragraph [0046] as referencing an incorrect figure number.

In response thereto, paragraph [0046] has been amended as suggested by the Examiner.

Paragraphs [0006] and [0009] have been amended for reasons of informalities. None of the paragraph amendments have added new matter.

Therefore, in view of the above, it is respectfully requested that the Examiner withdraw the objection to the specification.

**Allowable Subject Matter**

The Examiner objected to claims 10-13, 24, 30 and 32 as being dependent upon a rejected base claim, but indicated that the claims would be allowable, if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants appreciate the Examiner's indication of allowable subject matter, but believe that all of the claims are allowable for the reasons given above.

**CONCLUSION**

In view of the above, Applicants respectfully request reconsideration of the Application and withdrawal of the outstanding objections and rejections. As a result of the amendments and remarks presented herein, Applicants respectfully submit that claims 1, 2, 4, 5, 10-13, 15, 19-26, 28-32 and 40 are not anticipated by nor rendered obvious by Tomell et al., Biscaldi and Burkhart et al. or their combination and thus, are in condition for allowance. As the claims are not anticipated by nor rendered obvious in view of the applied art, Applicants request allowance of claims 1, 2, 4, 5, 10-13, 15, 19-26, 28-32 and 40 in a timely manner. If the Examiner believes that prosecution of this Application could be expedited by a telephone conference, the Examiner is encouraged to contact the Applicant.

The Commissioner is hereby authorized to charge any additional fees and credit any overpayments to Deposit Account No. 50-1059.

Respectfully submitted,

**McNEES, WALLACE & NURICK**

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